Archimedes' Principle

Name: _____ Section: 2AL-___ Date performed: __/__/__

Lab station: _____ Partners: _____

The following value will be of considerable use in this lab.

$$\rho_w g = \_\_\_\_\_ \text{ gwt/ml}$$

A. Verifying Archimedes' Principle for objects that sink

(Q-1) Describe your method. What sample do you plan to test with? What measurements are you planning to make? Be concise, but complete.

(Q-2) Record your data and perform the calculations indicated by your method described above.

(Q-3) State your conclusions. Does your data above support Archimedes' Principle? How can you tell?

B. Verifying Archimedes' Principle for floating objects

(Q-4) Weigh the object and then determine the amount of water it displaces.

$W_{\text{obj}} =$ _____ gwt $\quad V_{\text{w}} =$ _____ ml $\quad W_{\text{w}} =$ _____ gwt

How did you determine the weight of the water displaced?

(Q-5) Compare the weight of the floating object with the weight of the water displaced?

$$\text{Percent discrepancy} = \frac{|W_{\text{obj}} - W_{\text{w}}|}{W_{\text{obj}}} \times 100\% = \text{\_\_\_\_\_}\%$$

C. Using Archimedes' Principle

(Q-6,7) Find the specific gravity of four different materials and use these values to identify the materials.

Sample number	Actual weight (gwt)	Apparent weight (gwt)	Specific gravity	Name of mineral

D. Floating vs. Sinking

(Q-8) Before you try it, try to predict what will happen.

Up _____ Down _____ No change _____

(Q-9) Now try it.

Water level with rocks in boat = _____ rocks overboard = _____

Up _____ Down _____ No change _____

Explain your results.

Exercises

What is the reason for the buoyancy force?

(A) An object's mass decreases when the object is immersed in a fluid.
(B) The pressure in a fluid increases with depth.
(C) The density of a fluid increases with depth.
(D) The gravitational acceleration is less inside a fluid than it is in a vacuum.
(E) Elves.

An object will surely float in a fluid if

(A) it has a large volume relative to the volume of the fluid.
(B) it is hollow inside.
(C) its mass is greater than the mass of an equal volume of fluid.
(D) its density is less than that of the fluid.
(E) its density is greater than that of the fluid.

An object will surely sink in a fluid if

(A) it has a small volume relative to the volume of the fluid.
(B) it is solid throughout its volume.
(C) its density is less than that of the fluid.
(D) its density is greater than that of the fluid.
(E) None of the above will *guarantee* that the object will sink.

Explain:

When an object is weighed "out of water" in order to determine its actual weight, it is immersed in air. Why do we not consider the buoyancy force acting on the object due to the air?

(A) Because air, being a gas, does not exert a buoyancy force.
(B) Air has such a low density that the buoyancy force it exerts is negligible.
(C) The scales we use were calibrated using standard weights which were immersed in air.

Explain why you did *not* choose either of the other two answers:

Suppose for Part B, you dropped the floating object in mercury instead of water. What would have happened (besides an epidemic of mercury poisoning)?

(A) The object would have sunk instead.
(B) The object would have floated, but would have displaced more liquid by volume.
(C) The object would have floated, but would have displaced less liquid by volume.
(D) The object would have floated, but would have displaced more liquid by weight.
(E) The object would have floated, but would have displaced less liquid by weight.